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Organic Chemistry

SECOND EDITION

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In summary, the hydroxy group in COOH can be replaced by halogen by using the same reagents employed in the conversion of alcohols into haloalkanes— 50Cl_2 and PBr₃. The resulting alkanoyl (acyl) halides are sufficiently reactive to reattacked by carboxylic acids to generate carboxylic anhydrides. Cyclic examples of the latter may be made from dicarboxylic acids by thermal dehydration.

19-9 739 Esters

9-9 Carboxylic Acid Derivatives: Esters

esters have the general formula RCOR'. They are perhaps the most important of the carboxylic acid derivatives. This section describes two methods by which esters are made—the mineral acid-catalyzed reaction of carboxylic acids with alcohols and the synthesis of methyl esters using diazomethane.

garboxylic acids react with alcohols to form esters

When a carboxylic acid and an alcohol are mixed together, no reaction takes place. However, upon addition of catalytic amounts of a mineral acid, such as all furic acid or HCl, the two components combine in an equilibrium process to all the such as a suffer and water (Section 9-4).

Acid-Catalyzed Esterification

$$\begin{array}{c|cccc} O & & & O \\ \parallel & & & \parallel \\ RCOH & + & R'OH & & & \parallel \\ Carboxylic acid & Alcohol & & Ester \end{array}$$

Esterification is not very exothermic. How can the equilibrium be shifted ward the ester product? One way is to use an excess of either of the two starting laterials; another is to remove the ester or the water product from the reaction function. In practice, esterifications are most often accomplished by using the cohol as a solvent.

The opposite of esterification is **ester hydrolysis**. This reaction is carried out der the same conditions as esterification, but, to shift the equilibrium, an exsor water is used in a water-miscible solvent.

$$\begin{array}{c} \text{CH}_{3} \\ \text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CCOOCH}_{2}\text{CH}_{3} \\ \text{CH}_{3} \end{array} \xrightarrow{\text{H}_{2}\text{SO}_{4}. \text{ HOH, propanone (acetone). } \Delta} \begin{array}{c} \text{CH}_{3} \\ \text{CH}_{3}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{2}\text{CH}_{3} \\ \text{CH}_{3} \\ \text{CH}_{3} \end{array}$$

Ethyl 2,2-dimethylhexanoate

2,2-Dimethylhexanoic acid